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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ZERVIGON, RUDY

ART UNIT

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1792

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/791,030	Applicant(s) LIU ET AL.	
	Examiner Rudy Zervigon	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 February 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 56-70 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 56-70 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 12, 2009 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 58 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 58 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: Claim 57 first discusses a *gas flow* “condition”, suggesting, according to Applicant’s specification that *an attribute of the gas flow* defines the claimed “condition”. As a result, the claimed “plasma-assisted process” is not understood in this context. The Examiner cannot apply a prior art reference, if one is needed beyond the below citations, for said teaching because of the above-stated ambiguity of the claim. Further, such a recitation is an

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intended use recitation in the pending apparatus claims because the “plasma-assisted process” is not considered to be part of the claimed controller.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 56-61, 64 65, 69, and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashley; Ethan (US 5565038 A) in view of Aral; Gurcan (US 6022483 A). Ashley teaches a thin film deposition system (Figure 1; column 8), comprising: a reaction chamber (7; Figure 1; column 8, line 13) coupled between a first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) and a second gas flow pathway (all piping downstream of 7; Figure 1; column 8), the first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) coupled upstream of the reaction chamber (7; Figure 1; column 8, line 13) and having switchable first (3) and second (4) flow limiting conductances¹ (3,4; Figure 1; column 8; lines 1-16); and the second gas flow pathway (all piping downstream of 7; Figure 1; column 8) coupled downstream of the reaction chamber (7; Figure 1; column 8, line 13) and characterized by a downstream flow limiting conductance (16; Figure 1; column 8; line 39) switchable under the control of a control system (20; Figure 1; column 9) configured to operate the downstream flow limiting conductance (16; Figure 1; column 8; line 39) – claim 56. Applicant’s claim requirement of “an atomic layer deposition (ALD) apparatus” is a claim requirement of intended use in the pending apparatus claims, and is *not* considered part of the claimed controller. Further, it has been held that claim language that simply specifies an

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intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Ashley further teaches:

- i. The ALD apparatus (Figure 1; column 8) of claim 56, wherein the first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) is configured to provide a first gas flow condition (on/off/values in between) different from a second gas flow condition (on/off/values in between), as claimed by claim 57. The operations described in columns 9 and 10 discuss a chamber pressure buildup thus requiring Ashley's first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) provide a first gas flow condition (greater flow) different from a second gas flow condition (smaller or off flow).
- ii. Claim 58 is believed to be a recitation of an intended use recitation in the pending apparatus claims because the "plasma-assisted process" is not considered to be part of the claimed controller.
- iii. The ALD apparatus (Figure 1; column 8) of claim 57, wherein the first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) is configured such that the first flow limiting conductance (3; Figure 1) is switched to the second flow limiting conductance (4; Figure 1) at a substantially coincident point in time as the first gas flow condition

¹ Conductance in "flow limiting conductance" is used here as a noun. See Applicant's section [0067] discussing

(on/off/values in between) is switched to the second gas flow condition (off/on), as claimed by claim 59. See Ashley's Column 9, lines 1-5.

- iv. The ALD apparatus (Figure 1; column 8) of claim 57, wherein the first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) is configured so that the first gas flow condition (on/off/values in between) is switchable to the second gas flow condition (on/off/values in between) prior to completion of material deposition during the first gas flow condition (on/off/values in between), as claimed by claim 60. See column 9 of Ashley. Applicant's claim requirement of "material deposition" is a claim requirement of intended use and is *not* considered part of the claimed controller. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).
- v. The ALD apparatus (Figure 1; column 8) of claim 57, wherein the downstream flow limiting conductance (16; Figure 1; column 8; line 39) is switchable from a first state (on/off/values in between) to a second state (on/off/values in between) at a different point in time than that at which the first gas flow condition (on/off/values in between) is

"metering conductances (e.g. metering valves)".

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switched to the second gas flow condition (on/off/values in between), as claimed by claim 61. See Ashley's operations at columns 9 and 10

- vi. The ALD apparatus (Figure 1; column 8) of claim 56, wherein the downstream flow limiting conductance (16; Figure 1; column 8; line 39) comprises a throttle valve, as claimed by claim 64.

Ashley does not teach:

- i. Ashley's control system (20; Figure 1; column 9) configured to operate the downstream flow limiting conductance (16; Figure 1; column 8; line 39) to maintain a nominally constant ratio of a conductance² of the first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) to a conductance of the second gas flow pathway (all piping downstream of 7; Figure 1; column 8) under varying gas flow conditions - claim 56
- ii. The ALD apparatus (Figure 1; column 8) of claim 64, wherein the throttle valve comprises an annular throttle valve located within the reaction chamber (7; Figure 1; column 8, line 13), as claimed by claim 65
- iii. The ALD apparatus (Figure 1; column 8) of claim 56, wherein the first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) comprises multiple gas flow pathways for purge gasses and chemical precursors which share one or more common inputs to the reaction chamber (7; Figure 1; column 8, line 13), as claimed by claim 69
- iv. The ALD apparatus (Figure 1; column 8) of claim 56, wherein the downstream flow limiting conductance (16; Figure 1; column 8; line 39) is switchable under the control of the controller to switch states (on/off/values in between) according to a difference in

residence times for passage of gas between (i) the first gas flow pathway (piping holding elements 1-6; Figure 1; column 8) and the reaction chamber (7; Figure 1; column 8, line 13), and (ii) the reaction chamber (7; Figure 1; column 8, line 13) and the downstream flow limiting conductance (16; Figure 1; column 8; line 39), as claimed by claim 70.

Aral teaches a semiconductor manufacturing apparatus (Figure 1; column 1; lines 9-26) including a discussion and teaching of flow conductance (column 6; lines 41-58) as being the ratio of flow rate to pressure drop for a flow element with a particular example of valves. Aral further teaches:

- i. a deposition apparatus (Figure 1) wherein the throttle valve (118; Figure 1) comprises an annular throttle valve located within the reaction chamber (112; Figure 1) – claim 65

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the operation of Ashley's control system (20; Figure 1; column 9), to add Aral's throttle valve inside Ashley's reaction chamber, and to add plural precursor conduits to Ashley's apparatus.

Motivation to optimize the operation of Ashley's control system (20; Figure 1; column 9) is for optimized results in reactor surface cleaning as taught by Ashley (column 5; lines 6-20).

Motivation to add Aral's throttle valve inside Ashley's reaction chamber is for additional control of Ashley's chamber pressure as taught by Aral (column 3; lines 49-58) and Ashley (column 6; lines 50-60). Further, it is well established that the duplication of parts is obvious (In re Harza , 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04).

² In this context "conductance" is an attribute of the "flow pathway" and is thus used here as an adjective. Conductance = volumetric flow rate across flow element / change in pressure across flow element. See Aral at column 6; lines 41-58

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7. Claims 66-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashley; Ethan (US 5565038 A) and Aral; Gurcan (US 6022483 A) in view of Sakai; Hiroyuki et al. (US 5070813 A). Ashley and Aral are discussed above. Ashley and Aral do not teach:

- i. The ALD apparatus (Figure 1; column 8) of claim 65, wherein the annular throttle valve includes multiple vanes, each having an axis therethrough, as claimed by claim 66
- ii. The ALD apparatus (Figure 1; column 8) of claim 65, wherein the annular throttle valve includes multiple blades arranged in an iris configuration, as claimed by claim 67
- iii. The ALD apparatus (Figure 1; column 8) of claim 65, wherein the annular throttle valve includes multiple blades, each having a number of holes therethrough, at least one of the blades being rotatable about an axis such that holes extending through the rotatable blade align with holes of at least one of the other blades to provide a passage through the annular throttle valve, as claimed by claim 68

Sakai teaches a coating apparatus including an iris throttle valve (10, 11; Figure 1, 2) located downstream from Sakai's chamber 1, Figure 1 for controlling reactor chamber pressure (19, 20; Figure 1). Sakai further teaches:

- i. The deposition apparatus (Figure 1) wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple vanes (10; Figure 2), each having an axis therethrough, as claimed by claim 66
- ii. The deposition apparatus (Figure 1), wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple blades (10; Figure 2) arranged in an iris configuration (Figure 2), as claimed by claim 67

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- iii. The deposition apparatus (Figure 1) of claim 65, wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple blades (10; Figure 2), each having a number of holes (a; Figure 2) therethrough, at least one of the blades (10; Figure 2) being rotatable about an axis such that holes (a; Figure 2) extending through the rotatable blade align with holes (a; Figure 2) of at least one of the other blades (10; Figure 2) to provide a passage through the annular throttle valve (10, 11, Figure 1,2), as claimed by claim 68

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Aral's throttle valve (118, Figure 1) with Sakai's iris valve.

Motivation to replace Aral's throttle valve (118, Figure 1) with Sakai's iris valve is for reproducing the exhaust rate "with high reproducibility" as taught by Sakai (column 1; lines 53-57).

Response to Arguments

8. Applicant's arguments with respect to claims 56-70 have been considered but are moot in view of the new grounds of rejection.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Friday schedule from 9am through 5pm. The official fax phone number for the 1792 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner

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can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435

/Rudy Zervigon/

Primary Examiner, Art Unit 1792